The Relationship between Early Childbearing and Cardiovascular Health in Women's Midlife

Research Thesis

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Abstract
An emerging body of evidence indicates that the age at which women have their first child has substantial consequences for their health across the life course (Williams et al. 2011). These effects are of great importance for women's health, since the stress associated with early childbearing can lead to weight related problems such as obesity (Davis et al. 2010). Evidence shows that obesity is one of the main precursors to hypertension (Mikhail et al. 1999). The purpose of this research is to broaden the perspective of public health experts by investigating the linkage between non-marital childbearing and hypertension in midlife. Data used from the National Longitudinal Survey of Youth (Bureau of Labor Statistics, Department of Labor 2009), to compare women's midlife cardiovascular health and time at first birth, while controlling for a range of background characteristics linked to both birth timing and health. If early life childbearing is positively correlated with worsened cardiovascular health at midlife, this may help interventionists and educators to inform adolescents about the risks of of having children early in life. A bivariate and multivariate analysis along with a logistic regression model was used order to arrive at the results of the highest risk for cardiovascular disease falling on those who give birth to children between the ages of 20 and 24. To conclude, such information can also help practitioners identify women who may be vulnerable to cardiovascular disease and guide early intervention and prevention efforts.

Existing Research and Literature Review

Early childbearing and Immediate Stress

Numerous studies examining the separate analyses of early child bearing, stress, weight gain, and cardiovascular disease and their undesirable effects show the importance of the subject, and thereby highlight the need for a study to link all of these variables together. While adolescent childbearing has decreased from the 1960's to the early 2000's (Price et al. 2014), it is still an issue, especially for those of Black and Hispanic origin. Birth rates aggregated corresponding to race and ethnicity show that in 2014 Hispanics have the highest teen birth rate of 38%, with Blacks following at 34.9%, and Whites at 17.3% (Martin et al. 2015).

Although most research focuses on adolescent childbearing, emerging evidence suggests that births to women in young adulthood (20-24) may also have deleterious consequences for their health (Mirowsky 2002). In 2013, the birth rate for women between 20-24 was 8.1% (Martin et al. 2015). Studies have also shown that parenting can lead to stress due to the continuous daily commitment needed by the child (Rullo and Musatti 2005). Early childbearing is also linked to increased risk of obesity, eventually leading to the onset of cardiovascular conditions such as hypertension shortly after pregnancy (Patchen et al. 2016). Many studies have examined the linkage between childbearing leading to stress and weight gain postpartum (Walker 2007), but we do not know much about the age of these mothers at the time of their first birth, or the linkage between their first birth and the longer term consequences of birth timing for cardiovascular health at midlife.

While the prominent goal of this study is not to examine stress, the subject lends itself as a crucial stepping stone that links all of the pieces together, i.e. early childbearing and hypertension in midlife. The fact that birth timing may have enduring consequences for cardiovascular health at midlife is strongly suggested by the evidence on the stresses of early childbearing. The birth of a child to an unprepared family can cause financial stress, which has negative impacts on health. (Link and Phelan 1995). Many early births are not planned, and research shows that pregnancy can lead to postpartum weight retention, which is yet another contributor to weight gain in women (Whitaker et al. 2014). Early childbearing has been reported to lead to either chronic or increasing stress based on the personal resources a mother has to give to her child (Chang and Fine 2007). These can include financial resources, family stability, and education. Given the well-documented effects of chronic stress on cardiovascular risk later in life, it is reasonable to expect that adolescent and young adult childbearing

will be negatively associated with cardiovascular health at midlife. This is the core hypothesis of the present study.

The relationship between chronic stress and women's health can be expanded upon by taking a physiological perspective on the subject. The hormone cortisol released by the adrenal gland in response to stress decreases immune response, reproductive activity, and the activity of growth hormone, whilst increasing fat circulation, glucose metabolism, and blood pressure. Cortisol is used as a measure of stress in mammals, and current research utilizes this source of information for various studies. One such study, examines the relationship between cortisol levels and women's work stress. Results show that factors such as high demands from work and low social support lead to increased cortisol levels in participants (Evolahti et al. 2006). The implication cortisol has on increasing blood pressure via the increased release of endocrines such as epinephrine and norepinephrine can lead to hypertension. High cortisol levels are also correlated with low socioeconomic status and other psychosocial stressors (Cohen et al. 2006).

Stress is one of the many mechanisms or pathways that lead to cardiovascular disease (Lovallo 2005). Hypertension is an important outcome to examine since it is one of the most significant measureable markers of cardiovascular disease.

Early Childbearing, and Chronic Stress

In general, having children can be very stressful for an unprepared couple, or single mother. Relationships examining the age of children and well-being of their parents have been studied extensively, and research shows that parental well-being is at its optimal level during the child's earliest years (Nomaguchi and Brown 2011). This relationship alone just shows the potential for increased stressors as time goes by. The initial event of having a child during one's teenaged years can cause great stress for the parents of the newborn, the relationship between these new parents, and the relationship between the new parents and their own parents. The study discussed above shows how time can only decrease the well-being of the parent when examining their relationship with their child. Age is an extremely important factor in this equation, and it is known that older and more experienced individuals are able to meet their parental responsibilities much better than younger parents (Jet, 1997). Another factor that further adds to the relationship between young parents and stress, is the fact that older parents usually have better financial statuses than young ones, which can only ease the burden for new parents (Ross and Huber, 1985). All of the research listed above points to the simple fact that having children, or having children early in life contributes to stress.

Race, Ethnicity, Childbearing, and Health

In the United States, understanding the links between birth timing and health cardiovascular health also requires a focus on race/ethnic differences. One reason is that there are large race/ethnic differences in birth timing (Kim and Raley 2015). Another is that race/ethnic differences show correlations with cardiovascular risk at midlife (Eun-Ok et al. 2014). Prior research on self-assessed health indicates that the effects of birth timing may differ by race (Brondolo et al. 2015) but we don't know specifically if this extends to cardiovascular health. Research studies show that Black women are much more likely to bear children early in life than Whites (John and Rowe 1990). To add further evidence to this detriment between Blacks and Whites, data shows that Blacks are not able to access as many high quality health care services as Whites (Smedley et al. 2003). This relationship could add to the immense stress given to adolescent parents.

In addition, evidence indicates that Blacks are affected more frequently by stress than Whites (Eitle and Turner 2003), suggesting that early childbearing may have more strongly linked to poor cardiovascular outcomes for Black compared to white women. This is likely due to the disadvantage associated with race in the United States that limits resources available to cope with stress. This is the

second core hypothesis of the study: Early childbearing is more strongly associated with high blood pressure at midlife for black compared to white women. We will also control for other cultural and environmental characteristics of these groups to attempt to isolate the effects of childbearing, per se, from the characteristics that may possibly influence it.

Support for this hypothesis would be particularly concerning from a public health perspective because it would indicate that the groups most negatively affected are also those who are most likely to experience early childbearing. Moreover, These circumstances usually fall into a line of perpetuating themselves over and over again. The financially unstable and detrimental environmental factors of having children early in life can inhibit the accessibility to higher education for these people, which further causes parenting anxiety (Nomaguchi 2011).

Existing Research, Limitations, and Objectives

While there are previous studies that examine the relationships between union history and childbearing, or financial burdens and childbearing, there is no previous study that examines the specific relations between early childbearing and its chronic effects on a woman's cardiovascular health in midlife. For example, a study on early childbearing and women's self-assessed health suggests that early childbearing has deleterious effects on midlife health for White and Black women, while not affecting Hispanic women (Williams et al. 2011). It is important to look specifically at cardiovascular health-related outcomes because self-assessed health has limitations. These limitations are caused by the fact that self-assessed measures are global measures that capture psychological well-being, as well as physical health status. More specific outcome measures linked to diagnoses overcome this limitation and provide a more objective and targeted assessment of the health consequences of early birth timing. Moreover, cardiovascular health outcomes are linked to stress through well-documented biological processes, making them an appropriate and relevant outcome for understanding more precisely how birth timing affects women's midlife health.

To summarize, while adolescent childbearing has decreased in the United States, births to women in early adulthood (20-24) remain common. In addition to teen births, the study will also examine births in early adulthood as a possible causation of high blood pressure in women's midlife. Some women perceive the addition of more children as a restriction upon their freedom in society, and this leads to stress in everything from relationships to finances. The cumulative stress brought upon these young parents in a short expanse of a few years turns into chronic stress.

DATA AND METHODS

Data

The 1979 National Longitudinal Survey of Youth (NLSY79) published by the Bureau of Labor Statistics U.S. Department of Labor in 2009, documents data with the purpose of investigating the lives of 4,926 young women and 4,837 young men. The individuals were between the ages of 14 and 22 in 1979, and were interviewed annually through 1994 and biennially since. We use data through 2008 when all women had reached age 40, the age at which our dependent variable is measured.

The analytic sample was constructed as follows. The sample was first limited to the 4,007 women who gave birth to a child that they brought to live with them in their household. Women who gave birth at age 40 or later (21) were removed since the age at which the dependent variable (high blood pressure) is measured is 40. Of the remaining 3,569 mothers, 417 (11.68%) were missing the age 40 health assessment and, therefore, the measurement of the dependent variable. An additional 29 women whose first birth occurred before age 15 were removed since that was the age at which many of the control variables are measured, and 107 whose first birth occurred after age 35 to allow a 4-year time lag between the measurement of the independent (age at first birth) and dependent (high blood pressure) variables. Finally, list-wise deletion was used to remove 522 women who were missing data on

one or more control variables, resulting in a final analytic sample size of 3,018 mothers whose first birth occurred between the ages of 15 and 35.

Measures

Age at First Birth. Variables were able to distinguish women whose first birth occurred during adolescence (ages 15-19), in early adulthood (ages 20-24), and ages 25-35.

Hypertension: The dependent variable was measured via the NLSY79. Respondents were asked when they reached age 40 about a range of health conditions including high blood pressure. If the responded answered yes, it was coded as 1, and if no, it was coded as 0.

Covariates.

Covariates were measured at or prior to age at first birth and include dichotomous indicators of (1) health problems that would limit ability to work that began prior to first birth, (2) residence with both biological parents at age 14, (3) urban residence at age 14, (4) residence in the U.S. South at age 14 (imputed n = 15), (5) contraceptive use prior to first pregnancy, (6) dummy variables indicating religious affiliation in childhood, (7) whether the respondent's mother had an adolescent first birth and for the following variables as proxies for the SES of the respondent's family of origin, (8) Whether reading material was available in the respondent's childhood home, (9) Whether the respondent lived in a household with an employed adult female at age 14 and (10) Whether the respondent lived in a household with an employed adult male at age 14.

Analysis

The analysis proceeds as follows. Descriptive statistics were presented for all variables in the analysis stratified by race and age at first birth (Table 1). Second, a cross tabs and chi squared analysis were used to analyze the bivariate association of age at first birth categories with high blood pressure by mid-life separately for Black and White women. Finally, a logistic regression was used to predict the odds of being diagnosed with high blood pressure by age 40 while controlling for a range of background characteristics that may influence both age at first birth and cardiovascular health.

Descriptives

Table 1 lays out the descriptives of the study by showing the averages for all variables organized by race. These variables are then organized into age ranges, and finally distributed over several categories including basic background, home environment, and religious affiliations during childhood.

RESULTS

Descriptive statistics

Descriptive statistics for all variables in the analysis stratified by race and age at first birth are presented in Table 1. The prevalence of the diagnosis of high blood pressure differs somewhat between all age groups, with woman aged between 15 to 19 and 20 to 24 having the highest incidence of diagnosis in both Black and White women. High blood pressure diagnoses are less prevalent among women whose first birth occurred between the ages of 25 and 35 than among those whose first birth occurred earlier. For example, 17.93% of black women whose first birth occurred at age 25-35 were diagnosed with high blood pressure by age 40, compared to 23.64% of black women whose first birth occurred at age 15-19. Similarly, 11.98% of white women whose first birth occurred at age 25-35 were diagnosed with high blood pressure by age 40, compared to 14.29% of white women whose first birth occurred at age 15-19. This provides preliminary support for the central hypothesis of the study.

Marriage at first birth is another category important to this study, since marriage during this crucial time usually brings many positives to parenting (Williams, Sassler, Frech, Addo, Cooksey 2011). 85.34%

of women who had their first birth between the ages of 15 to 19 were not married during their first birth, compared to 39.67% of those who had their first birth between the ages of 25-35 never being married during their first birth. For whites, 30.70% of women who had their first birth between the ages of 15 to 19 were not married during their first birth, compared to 12.44% of those who had their first birth between the ages of 25-35 never being married during their first birth. A few similar trends can be observed between Blacks and Whites such as the new parent's mother's years of education, whether or not the mother had a child herself and the presence of reading material in the home whilst the individual was growing up. In general, as the individual's mother's years of education increased, the age at which the individual had their first birth also increased, suggesting a positive association between education and age at which a woman has her first child. Another positive association can be noted whilst comparing whether or not the individual had reading material in the home as a child. As age at first birth increases, the presence of reading material in the individual's home increases for example in Blacks from 76.12% for woman having their first birth between 15-19 to 88.59% for women having their first birth between 25-35. The same association is present for whites, with 92.10% of individuals giving birth to their first child between the ages of 15-19 having reading material, to 97.91% of individuals giving birth to their first child between the ages of 25-35 having reading material present in their homes. Another association to examine can be observed when viewing the participants home environment before age 14. Those that lived with both parents would more often delay childbearing than those who didn't. Black women who had their first birth between 15 and 19 were less likely to have lived with both parents at 41.08%, while 52.03% of Black women who had their first birth between ages 20 and 24 lived with their parents. The same relationship can be seen between white women, with 71.12% of white women who had their first birth between 15 and 19 having both of their parents' home, versus 85.65% of white women who had their first birth between ages 25 and 35 having both of their parents' home before age 14.

Race differences in high blood pressure overall portrayed in table 1 are consistent with the vast body of evidence indicating worse cardiovascular health among Black compared to White women across all ages at first birth. While black and white women were similarly likely to have mothers who worked while they were growing up, white women were more likely than black women to have fathers who worked during their childhood. Religious affiliations varied for all groups.

Bivariate Analysis: Cross-tabs with Chi-Square

Table 2 describes the cross-tabs showing the bivariate association between age at first birth and diagnosis of high blood pressure by age 40. It also presents chi squared analysis testing the significance of whether or not the the observed associations were due to chance or not. When only black mothers were grouped together, the findings were only marginally significant, with a P value of .057, slightly larger than .05, while with white mothers the findings were insignificant with a relatively large P value of .587. When Blacks, Whites and Non-Whites were all taken into account, the findings proved to be very significant with a P value of .001. Turning first to Panel A, the findings show that 23.64% of black women whose first birth occurred at age 15-19 were diagnosed with high blood pressure compared to 27.56% of those whose first birth occurred at age 20-24. However, only 17.93% of black women whose first birth occurred at age 25-35 were diagnosed with high blood pressure by midlife, providing preliminary support for the core hypothesis of the study (with a marginal level of statistical significance p=.057). Later births are associated with a lower likelihood of being diagnosed with high blood pressure than adolescent or young adult first births among black women.

Turning next to Panel B, we observe much smaller variation in high blood pressure diagnoses across age at first birth among white women than was seen among black women. 14.39% of white women whose first birth occurred at age 15-19 were diagnosed with high blood pressure by midlife

compared to 12.82% of those whose first births were age 20-24 and 11.98% of those whose first births were between age 25 and 35. These small differences are not statistically significant (p=.581).

Turning finally to Panel C (the total sample, which includes black, white, and Hispanic women), the p values indicated by the chi squared analysis indicate a low likelihood of this association being due to chance and the patterns observed support the core hypothesis of the study: Adolescent and young adult childbearing are associated with a greater likelihood of being diagnosed with high blood pressure by midlife than is beginning childbearing between age 25-35.

Table 2, Panel A also holds another finding, in that black women who bear their first child between ages 20 and 24 have the highest percentage of individuals diagnosed with high blood pressure in midlife, with a leading 27.56%. This may suggest that first births in early adulthood are equally or perhaps more detrimental to the cardiovascular health of black women than are births in adolescence, potentially important information for public health professionals and practitioners aiming to target their efforts to improve population health. However, the chi-square test, as an omnibus test, does not test the significance of differences between specific categories of the independent variable—only the variation across all categories. Next we turn to a multivariate analysis which can make this distinction and also has the advantage of allowing a wide range of background characteristics that may be linked to both age at first birth and health to be controlled, which minimizes the probability of spurious associations.

Multivariate Analysis: Logistic regression

Table 3 presents the results of a series of logistic regression analyses (odds ratios) of the association of age at first birth with the dichotomous dependent variable—high blood pressure diagnosis by age 40—while controlling for a range of background characteristics measured before first birth. Odd-numbered models show the association between the independent and dependent variable before entering control variables. Even-numbered models present the full analysis including all control variables. The first set of models (Model 1 and 2) includes the full sample of white, black, and Hispanic mothers. Models 3 and 4 are limited to black mothers and Models 5 and 6 are limited to white mothers. There were too few Hispanic mothers in each age at first birth category to conduct analyses separately for this group.

As shown in Model 1 and consistent with the bivariate resulted presented in Table 2, women in the total sample whose age at first birth occurred between age 15-19 or between age 20-24 are significantly more likely to be diagnosed with high blood pressure by age 40 than women whose first birth occurred between age 25-35. However, Model 2 shows that after control for a wide range of background characteristics, teen childbearing is no longer significantly associated with increased risk of high blood pressure in the total sample. It is childbearing in early adulthood—between the ages of 20 and 24—that is linked to increased cardiovascular risk compared to becoming a mother at age 25-35. This provides partial support for the central hypothesis of the study.

The results are very similar to those just described when the analysis is limited to black women in Models 3 and 4. Here, however, teen childbirth is not linked to increased risk of high blood pressure among black women even before controlling for background characteristics. After controls, births to black women in early adulthood continued to be significantly associated with greater risk of high blood pressure by midlife compared to births to black women that occur between age 25-35. This estimated effect of young adult childbearing is not only statistically significant, but also quite large. The model predicts that, compared to black women whose first birth occurs between age 25-35, the odds of black women whose first birth occurs between age 20-24 being diagnosed with high blood pressure by age 40 are 1.765 times higher.

Table 1. Descriptive Statistics on Imputed Analytic Sample: U.S. Women Ages 14 to 22 in 1979 with a first birth between Ages 15 and 35 (National Longitudinal Survey of Youth, 1979).

	Black Women			White Women		
Age at 1st birth	15-19	20-24	25-35	15-19	20-24	25-35
Diagnosed with High Blood Pressure	23.64%	27.56%	17.93%	14.29%	12.82%	11.98%
Never-married at first birth	85.34%	59.72%	39.67%	30.70%	11.52%	12.44%
Health limitations before 1st birth	11.35%	7.77%	3.26%	13.98%	7.48%	5.01%
R's mother's education (years)	9.99	11.01	11.18	10.59	11.52	12.44
R's mother had adolescent 1st birth	13.00%	10.60%	5.98%	8.81%	6.84%	2.22%
R used contraception before birth	32.38%	47.70%	44.02%	36.17%	60.04%	49.90%
Home environment at age 14						
Lived with both parents	41.08%	52.30%	61.41%	71.12%	76.07%	85.65%
South	63.83%	59.71%	56.52%	39.21%	25.43%	25.91%
Urban	79.43%	77.74%	80.43%	70.21%	75.64%	77.72%
Reading material in home	76.12%	87.99%	88.59%	92.10%	95.51%	97.91%
Mother (figure) in home worked	55.79%	60.77%	63.04%	51.97%	54.05%	51.95%
Father (figure) in home worked	51.77%	61.13%	67.39%	81.76%	85.47%	88.02%
Religious Affiliation in Childhood						
Baptist (reference)	65.96%	67.13%	59.24%	36.77%	20.94%	13.23%
Catholic	7.09%	8.12%	10.87%	22.40%	29.05%	39.97%
Liberal Protestant	10.17%	10.60%	16.30%	24.62%	32.26%	31.34%
Other Religion	11.11%	10.95%	10.87%	9.12%	13.25%	10.31%
No Religion	5.67%	3.18%	2.72%	6.08%	4.49%	5.15%
Observations	423	283	184	329	468	718

A quite different pattern is seen among white women (Models 5 and 6). Neither adolescent first births or early adult first births are significantly associated with high blood pressure among white women.

Discussion

For years, public health organizations, school systems, educators, practitioners and many others have been fighting to spread awareness about the risks of early childbearing, and this study seeks to unearth yet another subject that we should be concerned about. We sought to find whether or not there was a relationship between early childbearing and the incidence of cardiovascular disease in the mother's midlife, as measured by high blood pressure. Our key finding is that becoming a mother between age 20-24, but not during adolescence is associated with increased risk of diagnosis of high blood pressure in adult women.

This has been a missing piece of the puzzle for public health since organizations divert most of their efforts to trying to prevent adolescent pregnancy. Statistics show that since the 1960's, birth rates have decreased slightly for those between 15 to 17, have decreased drastically for those between 18 to

Table 2. Chi Squared analyses testing the association of age at first birth with diagnosis of high blood pressure by midlife

Panel A: Black Mothers (Pearson chi^2 (2) = 5.7155 Pr = .057, marginally significant)

High Blood Pressure	Age 15-19	Age 20-24	Age 25-35	Total
0	323 76.36%	205 72.44%	151 82.07%	679 76.29%
1	100 23.64%	78 27.56%	33 17.93%	211 23.71%
Total	423	283	184	890

Panel B: White Mothers (Pearson chi^2 (2) = 1.0852 Pr = .581, not significant)

High Blood Pressure	Age 15-19	Age 20-24	Age 25-35	Total
0	282 85.71%	408 87.18%	632 88.02%	1322 87.26 %
1	47 14.29%	60 12.82%	86 11.98%	193 12.74%
Total	329	468	718	1515

Panel C: Black, White, and Hispanic mothers (Pearson chi^2 (2) = 14.5888 Pr = .001, significant)

High Blood Pressure	Age 15-19	Age 20-24	Age 25-35	Total
0	803 82.53%	800 82.30 %	941 87.70%	2544 84.29 %
1	170 17.47%	172 17.70%	132 12.30%	474 15.71%
Total	973	972	1073	3018

19, and have decreased slightly for those between 20 and 24 (Hamilton, Martin, Osterman, Curtin, Mathews 2015). The data found in this study indicates that, at least with respect to cardiovascular outcomes, the problem is not teen births, but births in early adulthood.

While teen births may be declining, and young adult births have declined slightly, having a birth as a young adult between 20-24 is much more common than having a child between 15 and 19 in 2014, with teenagers having the lowest birth rate of 24.2 births per 1,000 females, those between 20-24 having 79 first births per 1,000 females, those between 25 and 29 having 105.8 births per 1,000 females, and those between 30 and 34 having 100.8 births per 1,000 women in 2014 (Hamilton, Martin, Osterman, Curtin, Mathews 2015). The main point of this is that the first time birth rate for 20-24 year olds is more than double the birth rate for teenagers. More efforts need to be diverted to educating men and women on the risks of having children in their early 20's due to the increased risk of cardiovascular disease later in life, along with the increased stressors associated with having children when unprepared.

Table 3: Odds ratios from logistic regression predicting odds of high blood pressure by age 40 among total sample, black women, and white mothers

	Total Sample		Black mothers		White mothers	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Age at first birth						
15 - 19	1.509***	1.126	1.417	1.342	1.225	1.054
	(.190)	(.163)	(.317)	(.332)	(.239)	(.234)
20 - 24	1.533***	1.391**	1.741**	1.765**	1.081	1.027
Ref (25 – 35)	(.192)	(.182)	(.407)	(.423)	(.194)	(.193)
Unmarried at 1st birth		1.086		1.032		1.194
		(.143)		(.195)		(.286)
Black (white = 0)		1.710***		---		---
		(.249)				
Hispanic (white = 0)		.746		---		---
		(.141)				
R's mother's education yrs		.979		1.005		.921**
		(.019)		(.034)		(.032)
R born to teen mother		.989		.658		1.215
		(.188)		(.185)		(.407)
R used contraception		.834*		.806		.997
		(.089)		(.135)		(.159)
Home environment age 14						
Lived with both parents		1.018		.831		1.382
		(.145)		(.184)		(.319)
South		1.227*		1.328		1.424*
		(.142)		(.234)		(.269)
Urban		.980		1.327		.893
		(.125)		(.284)		(.160)
Reading material in home		.950		.726		2.420*
		(.153)		(.159)		(1.181)
Adult female employed		1.013		1.140		.981
		(.105)		(.191)		(.156)
Adult male employed		.883		1.193		.675
		(.131)		(.268)		(.162)
Religion in childhood						
Catholic		.977		.928		1.107
		(.160)		(.287)		(.280)
Liberal/Protestant		1.019		.838		1.306
		(.162)		(.225)		(.309)
Other		1.065		1.134		1.248
		(.194)		(.292)		(.362)
None		.652		.583		.868
		(.198)		(.270)		(.389)
Ref = Baptist						
Never married at 1st birth		.954		.957		.789
		(.185)		(.276)		(.245)

Constant	.140***	.194***	.219***	.192***	.136***	.144***
	(.013)	(.062)	(.042)	(.096)	(.016)	(.095)
Observations	3,018	3,018	890	890	1,515	1,515

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Another finding from the study shows that Blacks in general had higher instances across the board of being diagnosed with high blood pressure when having their first birth in any of the age categories than Whites. This can be due to the fact that blacks are possibly less likely to be diagnosed with cardiovascular problems due to their inaccessibility to healthcare (Edge 2010).

The multivariate analysis' largest finding is that young adult births between 20 and 24 are the only ones that show significance with regards to birth timing and incidence of hypertension. This could be due to a number of reasons, but it is hypothesized that since women between ages 15 and 19 generally live at home with their parents they have access to more resources to cope with the physical, mental, and financial stresses of a birth than those between 20 and 24, when most are out on their own. Future research should explore the 20 to 24 year-old age range more in depth since this seems to be a vulnerable age for these individuals.

A second key finding is that estimated effect of young adult first birth on high blood pressure is observed only among black women and not white women. This could be due to the fact that Blacks in general have less resources available to them than whites both medically and socially, and are thus more prone to both having children at a young age and cardiovascular health.

Limitations of the study include the fact that the NLSY79 is a self-reported study. Studies like these carry slightly less validity than experiments due to the fact that they are based off of someone's honesty, instead of their real actions as told by an experiment or observation. Another limitation is that some individuals could have not even been diagnosed with high blood pressure to their inability to access healthcare. However, this would likely lead to more conservative estimates of the effect of age at first birth on high blood pressure than observed here because those with younger ages at first birth are probably less likely to have access to health care than those with older ages at first birth. For example, increased financial hardships experienced by those who bear children as teenagers or too early in life may lead them to be less likely to diagnosed with high blood pressure later in life due to insufficient medical care

One of the strengths of the NLSY79 is that it is a measure of a large number of characteristics, so we are able to rule out many spurious associations. Unfortunately, there still might be unobserved factors that link to variables together since it is difficult to establish causality in observational studies due to the inability to measure all possible confounders. The study controlled for a large range of variables in order to level the playing field between all individuals whose statistics were tested.

In sum, while most of the prior research on early childbearing revolved around the individual's teenaged years, this study found a different age group the we must be concerned about. Public health researchers must put those between the ages of 20 and 24 in their site since they are most afflicted by hypertension in midlife. Hypertension leads to countless other diseases, and anything that can be done to lessen its prevalence in the population must be explored to its utmost end.

References

Brondolo E., Rahim R., Grimaldi S.J., Ashraf A., Bui N., and Schwartz J.C. Place of birth effects on self-reported discrimination: Variations by type of discrimination. *Internation Journal of Intercultural Relations. 49* 212-222

Chang, Y. and Fine M.A. (2007). Modeling parenting stress trajectories among low-income young mothers across the child's second and third years: Factors accounting for stability and change. *Journal of family psychology, 21*(4) 584-594.

Cohen S., Doyle W.J., and Baum A. (2006). Socioeconomic status is associated with stress hormones. *Psychosomatic medicine. 68*(3) 414-420.

Davis, E.M., Zyzanski S.J., Olson, C.M., Stange, K.C., and Horwitz R.I. (2009). Racial, Ethnic, and Socioeconomic Differences in the Incidence of Obesity Related to Childbirth. *American Journal of Public Health. 99*(2) 294-299.

Edge D. (2010). Falling through the net – Black and minority ethnic women and prenatal mental healthcare: health professionals' views. *General Hospital Psychiatry*. *32*(1) 17-25

Eitle, D. and Turner R.J., (2003). Stress Exposure, Race, and Young Adult Male Crime. *Sociological Quarterly*. *44*(2) 243-269.

Eun-Ok I., Ham O.K., Chee, E., and Chee, W. (2014). Racial/Ethnic Differences in Cardiovascular Symptoms in Four Major Racial/Ethnic Groups of Midlife Women: A Secondary Analysis. *Women and Health. 55*(5) 525-547.

Evolahti, A., Hulcrantz, M., and Collins, A. (2006). Women's work stress and cortisol levels: A longitudinal study of the association between the psychosocial work environment and serum cortisol. *Journal of Psychosomatic Research, 61*(5) 645-652.

Jet (1997). Older people make better parents, study says. *91*(16) 33-33.

John C. and Rowe D. (1990). Adolescent Background and Fertility Norms: Implications for Racial Differences in Early Childbearing. *Social Science Quarterly*. *71*(1) 152

Johnson, A.B. and Rodgers, J.L. (2006). The Impact of Having Children on the Lives of Women: The Effects of Children Questionnaire. *Journal of Applied Social Psychology, 36*(11), 2685-2714.

Kim Y. and Raley R. (2015). Race-Ethnic Differences in the Non-marital Fertility Rates in 2006-2010. *Population Research & Policy Review*. *34*(1) 141-159.

Link, B.G. and Phelan, J., (1995). Social conditions as fundamental causes of disease. *Journal of health and social behavior, 80*(94).

Lovallo W.R. (2005). Cardiovascular reactivity: Mechanisms and pathways to cardiovascular disease. *International Journal of Psychophysiology, 58(*2-3) 119-132

Martin, J.A., Hamilton, B.E., Osterman, M.J.K. Osterman, Curtin, S.C., and Mathews, T.J., (2015). Births: Final Data for 2013. *National Vital Statistics Reports, 64*(1), 1-14.

Mikhail, N., Golub M.S., and Tuck M.L. (1999). Obesity and hypertension. *Progress in Cardiovascular Disease, 42*(1), 39-58.

Mirowsky, J. (2002). Parenthood and Health: The Pivotal and Optimal Age as First Birth. *Social Forces*, *81*(1) 315-349.

Nomaguchi K.M. and Brown, S.L. (2011). Parental Strains and Rewards Among Mothers: The Role of Education. *Journal of Marriage & Family*, *73*(3) 621-636.

Patchen, L., Rebok, G., and Astone N.M., (2016). Differences in Obesity Rates Among Minority and White Women: The Latent Role of Maternal Stress. *Journal of midwifery & women's health, 61*(4), 489-496.

Price, S.K., El-Khoury, D., and Wonnum, S. (2014). Adolescent Pregnancy in the United States. *International Handbook of Adolescent Pregnancy,* 661-681.

Ross, C.E., and Huber, J. (1985). Hardship and Depression. *Journal of Health and Social Behavior*. *26*(4) 312-327.

Rullo, G. and Musatti, T. (2005). Mothering young children: Child care, stress and social life. *European Journal of Psychology of Education, 20*(2), 107-119.

Siapush M., Borland R., and Scollo M. (2003). Smoking and financial stress. *Tobacco Control*, *12*(1) 60-66

Smedley B.D., Stith A.Y., and Nelson A.R. (2003). Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington (DC). National Academics Press (US).

U. S. Census Bureau. 2007. "Current Population Survey Annual Social and Economic Supplement." Retrieved March 1, 2017 (http://www.census.gov/population/www/socdemo/hh-fam/cps2007.html).

Walker, L.O. (2007). Managing Excessive Weight Gain During Pregnancy and the Postpartum Period. *Journal of Obstetrics, Gynecologic, and Neonatal Nursing. 36*(5) 490-500.

Whitaker, K., Young-Hyman D., Vernon M., and Wilcox S., (2014). Maternal stress predicts postpartum weight retention. *Maternal and child health journal, 18*(9) 2209-2217.

Williams, K., Sassler, S., Frech A., Addo F., and Cooksey E. (2011). Nonmarital Childbearing, Union History, and Women's Health at Midlife. *American Sociological Association, 76*(3), 465-486.